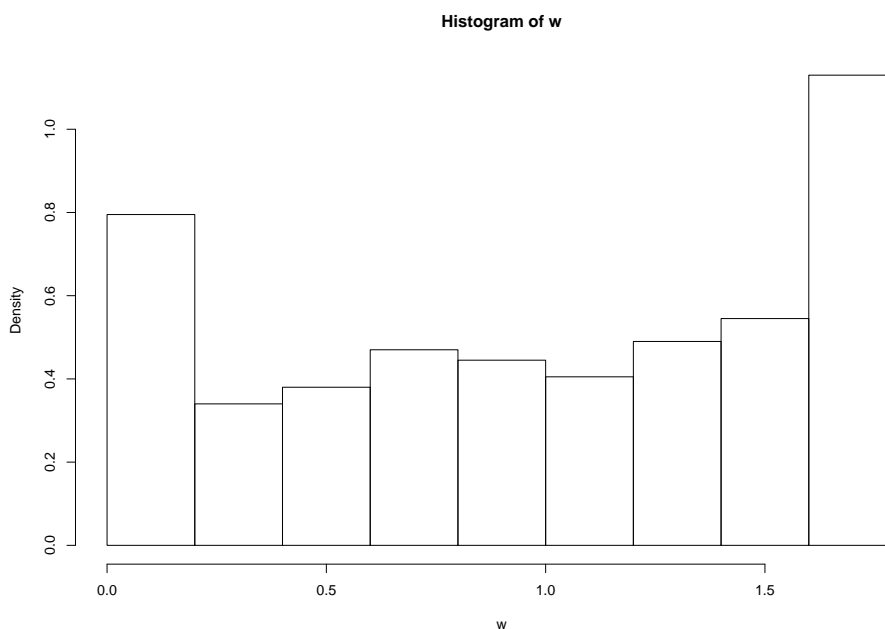


Example on Importance Sampling

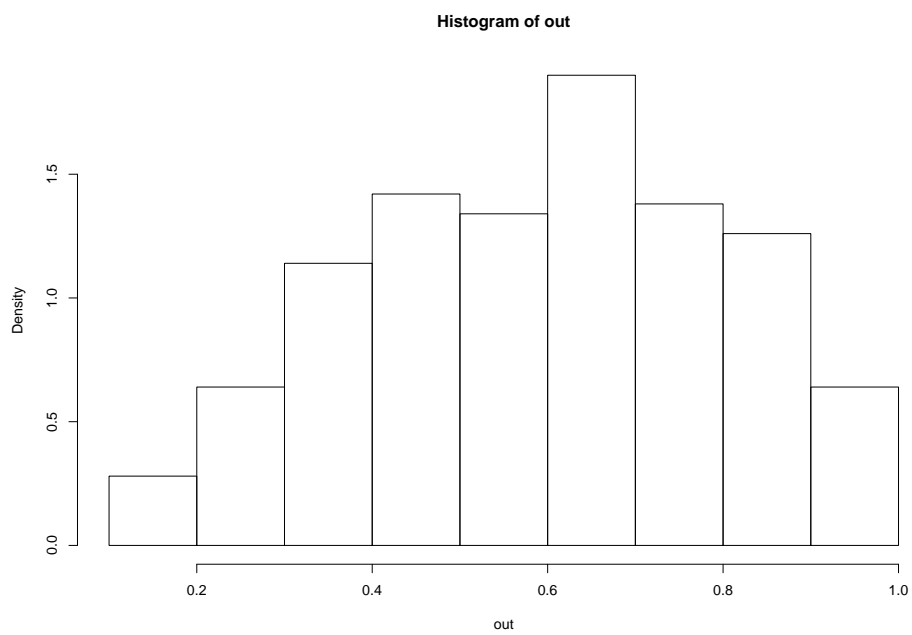
Suppose we wish to estimate the first and second moments of a $Beta(3,2)$ distribution and importance density is the Uniform $(0,1)$. Then $g(x) = Beta(3,2)$ and $I(x) = U(0,1)$

```
x <- runif(1000)
w <- dbeta(x,3,2)/dbeta(x,1,1)
# Approx, of first moment
sum(x*w)/sum(w)
[1] 0.5961628
# Approx. of second moment
sum(x^2*w)/sum(w)
[1] 0.3969989
hist(w,prob=T)
```



Resampling

```
out <- sample(x,500,replace=T,prob=w)
```



STA 590: R examples on Gibbs Sampling

```
# Prior parameters
a <-2
b <-4
m <- 16
# prepare objects to save iterations
it <- 1500
x<- rep(NA,it)
th <- rep(NA,it)
# set initial value
x[1] <- 1
th[1] <- 0.5
# Perform Gibbs iterations
for (i in 2:it)
{
  x[i] <- rbinom(1,size=m,prob=th[i-1])
  th[i] <- rbeta(1,a+x[i],b+m-x[i])
}
# Throw away first 500 values
x <- x[501:it]
# Approx. values for mean and SD of Beta-binomial
mean(x)
[1] 5.568
sqrt(var(x))
[1] 3.422147
```

Example 2 Truncated Exponential Random Variables

```
B <- 5
# function that simulates from truncated exp
trunexp<-function(lam,B)
{
  x<- -(1/lam)*log(1-runif(1)*(1-exp(-lam*B)))
  return(x)
}
# prepare objects to save iterations
it <- 550
x <- rep(NA,it)
y <- rep(NA,it)
# set initial
x[1]<- 1.5
y[1] <- 1.5
for(i in 2:it)
{
  x[i] <- trunexp(y[i-1],B=5)
  y[i] <- trunexp(x[i],B=5)
}
# throw away first 50 iterations
#
x <- x[51:500]
mean(x)
[1] 1.337892
mean(x^2)
```

[1] 3.392702

You may find the code for these examples and for the Beta-Binomial with Poisson prior in the file *gibbs1.s*.